

alluvial plain, on the banks of the river Guayas, and is frequented by ocean-going vessels up to 28 ft. in draught. The absence of a proper system of water supply, combined with ineffective drainage, has militated hitherto against the development of the town, but now that the Government has taken both these matters in hand there is every prospect, despite certain climatic disadvantages, of the attainment of a very serviceable degree of civic sanitation. The total estimated outlay is in the neighbourhood of 2,000,000l., and the work is being carried out progressively, in instalments. A fresh system of water mains is already laid, and a storage reservoir of 6,600,000 gallons capacity is nearing completion. It has not yet been definitely decided whether the source of supply shall be the Daule river, with an intake some twenty miles upstream, or a group of mountain streams in the forests of the Cordillera de los Andes, some sixty miles distant from Guayaquil. The drawbacks in the former case are the pollution arising from settlements along the banks of the river, the high percentage of suspended matter in the water, and the low gradient, which would necessitate pumping. The mountain streams would readily admit of a gravitation supply, and are less likely to be polluted, but the construction of the pipeline would be a heavy initial expense. The Government has both schemes under consideration, and data and statistics are being obtained with a view to an early decision.

OUR ASTRONOMICAL COLUMN.

THE LEONIDS OF 1916.—With the parent comet (1866 I, Tempel) near aphelion an abundant shower of Leonids was not expected, but it was important to ascertain whether the display returned even in a minor character. Mr. Denning writes that on the morning of November 15 he saw only one Leonid in a watch of about an hour between 4 and 5.30 a.m. The next morning was overcast, but on November 17, between 3 and 6.15 a.m., notwithstanding wintry conditions and one of the keenest north-easterly winds experienced in recent years, Mrs. Fiammetta Wilson, of Totteridge, recorded fifteen meteors, including some brilliant objects. There were seven Leonids from a radiant point very sharply defined at $150^{\circ}+22^{\circ}$. This position appears to be identical with that usually found on the mornings of November 14 and 15, and apparently favours the view that there is no perceptible change in the place of radiation. But more exhaustive data are required in settlement of this interesting feature.

The brightest meteor seen by Mrs. Wilson was at 3h. 33m. a.m. (November 17). It was equal to Venus, and shot from $215^{\circ}+58^{\circ}$ to $245^{\circ}+57\frac{1}{2}^{\circ}$ —evidently a fine Leonid. Bright meteors of the same shower were seen at 4h. 50m. and 5h. 42m. At 3h. 16m. a large Taurid, comparable with Jupiter, travelled from $188\frac{1}{2}^{\circ}+57^{\circ}$ to $204^{\circ}+48^{\circ}$. If duplicate observations of any of these objects were obtained at other stations, the records would be valuable for comparison.

THE SOLAR APEX DETERMINED BY MEANS OF BINARY STARS.—The method of determining the solar apex proposed by Bravais in 1843 has until lately not been used by any other investigator, no doubt because it assumes the distances of the stars to be known, and nobody has been inclined to follow Bravais in making them all equal. Some years ago Weersma applied the method to 3616 stars, taking the distances from Kapteyn's tables of mean parallaxes. His result, $267.7^{\circ}+31.4^{\circ}$, was in good accordance with the best previous determinations, though the velocity, 14.9 km., was smaller than the spectroscopic result. In a paper recently published in the Proceedings (*Oversigt*) of the

Royal Danish Academy of Sciences, M. Lupaui Janssen has applied the method to 180 double stars, the proper motions of which are given in the Preliminary General Catalogue of Boss. Assuming the mass of a binary star equal to that of the sun, well-known formulæ give a value of the parallax called the "hypothetical parallax." Hertzsprung has shown (*Astronomische Nachrichten* 4543) that where the annual change of position angle and distance is known, it is possible to find a minimum value of this hypothetical parallax of a binary star. From a comparison of thirty-six values of parallaxes actually measured with the computed values of the minimum hypothetical parallax M. Janssen finds that the latter may be put equal to half the real parallax. On this assumption he finds the apex to be $264.5^{\circ}+26.1^{\circ}$, and the velocity equal to 17.15 km. per sec. This result is in surprisingly good accordance with the best recent determinations, and this shows at any rate that the hypothetical minimum parallax is a quantity which is not without some value where there is no satisfactory value of the parallax resulting from measures.

SPECTRUM OF THE NEBULA ABOUT RHO OPHIUCHI.—At the Lowell Observatory, Dr. V. M. Slipher has lately attempted to photograph the spectrum of the remarkable nebula in the region of ρ Ophiuchi (*Popular Astronomy*, vol. xxiv., p. 542). A single-prism spectrograph of high light-power was used, and an image was formed on the slit by a simple lens of 20 cm. focal length. The total exposure, on four nights, was twenty hours, and by comparison with the exposures for direct photographs given by Barnard, it was estimated that this would give a good record of the spectrum if of the bright-line type, or would give a weak impression if the spectrum were continuous. The plate obtained was of the latter type, the spectrum of the nebula appearing faintly on either side of that of the star. So far as can be judged from the photograph, the spectrum is like that of the star about which the nebula clusters, and Dr. Slipher regards this as an indication that the nebula shines by reflected light, as he previously found reason to believe to be the case with the nebulae in the Pleiades. In both these regions of the sky faint stars are conspicuously deficient in number, and it is suggested that their apparent scarcity may be due to their obscuration by nebulae which may be otherwise invisible.

BRITISH INDUSTRY AND THE WAR.

THE advice of a recent ex-Minister of State that we might well leave after-the-war conditions to take care of themselves finds little response in the world of industry, whether in regard of employers or employed, who are alike viewing with deep concern the industrial and commercial problems that will surely arise on the advent of peace. This finds clear expression in a valuable memorandum issued in June last by the Garton Foundation entitled "The Industrial Situation after the War," which is fully and sympathetically further considered in the *Quarterly Review* for October by a member of the group which prepared it. This highly important memorandum has been drawn up by a group of men representative of the capitalist and employing classes, of organised labour, as well as by men familiar with finance, economics, and administration. It has further been circulated, and discussed in draft by, large employers, trade union officials, and experts on social and economic questions with a view to their criticisms and suggestions. It is now published in the hope of stirring both employers and employed to action. The industrial problem, it declares, was with us before the war. The dangers of labour unrest and the cry for increased efficiency are

familiar to all. But the war has profoundly affected both the circumstances and the minds of men, and has gravely accentuated the complexities of the situation and the peril in which our industries stand. It is strongly urged, since industry as a whole is inextricably interwoven with the social and political life of the nation, that we cannot too soon bring to bear upon the various intricate questions involved the best intelligence and experience at our command with the object of formulating a policy based upon a comprehensive survey of all aspects of industrial conditions.

A further article appears in the *Review* dealing with British trade and manufactures and the necessity for better organisation and more efficient methods of production if we are to succeed in maintaining not only our position in the markets of the world, but also our ability to meet the vast expenditure which the war has entailed. We have failed, says the writer, as compared with America and Germany, in our methods of production, transport, and marketing, in the neglect of co-operative effort, in fertility of design and invention and in adaptability to the needs of the foreign consumer, in our provision for commercial education, and, finally, in the support of the Government in aid of trade. Before the war German goods were extensively sold in this country, and the foreign trade of Germany, whilst not so large as our own, was extending much more rapidly. It is stated that there is not the slightest doubt that we have fallen behind Germany in efficiency of manufacture of certain products in respect of both design and price, and that in order to achieve success we must produce better and cheaper goods. So far as our home trade is concerned we may exclude German goods by high tariffs, but that will not help us in foreign markets, nor is it the true remedy, which can be found only in better provision for education and a higher standard of efficiency. A strong plea is put forward for the establishment of a Ministry of Commerce, the duty of which it shall be to foster and assist British trade both at home and abroad.

BOTANY AT THE BRITISH ASSOCIATION.

THE president in his address struck the economic note, which was sustained throughout the meeting, probably the most notable contributions being the discussions on plant disease; on the utilisation of waste lands; on the botanical aspects of coal; and on the medicinal plant industry.

The discussion on plant disease was opened by Prof. Potter, of Newcastle, who laid stress on the enormous importance of the subject in relation to the world's food supply and to many other commercial products. He stated that, on an average, about one-third of these crops are lost by disease, and that a loss of two and a half millions sterling occurred in Australia one year through "rust" of wheat alone. The destruction of timber, as of many Colonial products, such as sugar, rubber, coffee, etc., is very serious. He showed how manifold are the problems underlying the treatment of plant disease, and dwelt upon the importance of various aspects demanding investigation, not alone in mycology, but in the associated physiological and pathological relations of host and parasite, and host and soil. Prof. Potter suggested two desiderata: (1) the improvement of the training of the investigator; (2) the establishment of a British Central Institute for the supply of pure cultures, which, with aniline dyes and optical glass, ceased at the outbreak of war.

Mr. Brierley, in a separate contribution, elaborated a suggestion for the formation of an Imperial Bureau of Mycology comparable with that recently established

in entomology, but providing, in addition, facilities for research and supply of pure cultures.

Mr. Ramsbottom alluded to the backward condition of British phytopathology, and spoke strongly of the lack of adequate training and subsequent support given to our investigators. He advocated a central station for research and advice.

Mr. Salmon and Dr. Eyre struck a hopeful note with regard to the readiness of farmers to make use of scientific results, which it therefore behoves us to produce. They referred to the necessity for co-operation between botanist, mycologist, and chemist for the elucidation of the very complex problem of plant disease and its treatment.

The discussion of the botanical aspects of coal was opened by Dr. Marie Stopes, who urged the importance of co-operation between palæobotanist, chemist, and ecologist for the discovery and right application of our coal resources. While Prof. Seward, who spoke later, was a little doubtful as to the great utilitarian value of botanical examination, the opener suggested that researches already indicated the possibility of association between the parts of plants making up the bulk of the coal and the particular by-product which it yielded. She pointed out the danger of confining investigation to Carboniferous fossils in view of the fact that the coal of India, for example, is for the most part Tertiary.

Prof. Weiss spoke of the correlation which had been demonstrated between the presence of spores and the chemical nature of the seams.

An interesting series of papers on utilisation of waste land was introduced by Prof. Oliver, who also gave a paper on the possibilities inherent in maritime waste land. He illustrated his remarks by special reference to sand dunes and to salt marshes, and showed that in both cases there are two modes of utilisation available: (1) to take advantage of the natural product; (2) to convert or reclaim, so that the land is available for more general purposes. In both habitats the natural product may be a grass capable of being cultivated at a profit for paper-making. But if capital and labour be spent on their reclamation, sand dunes add profitably to our timber area, and salt marshes are known to give very fertile soil. It might well be that in the time immediately following the war this would afford excellent transitional labour for our soldiers.

Mr. Martineau, of the Reafforesting Association, demonstrated by means of lantern-slides the success of the society's planting on pit mounds in the Black Country, and gave every reason to suppose that it would prove a sound financial undertaking.

Dr. W. E. Smith developed in some detail the complexity of the problem of improvement in utilisation of mountain and heath land. He showed, however, that improvement could be effected by more frequent burning, as recommended by the Grouse Committee, by inclusion of more cattle with sheep grazing, as well as by the more drastic measure of restriction of deer forest and grouse moor to the more inaccessible uplands.

The possibility of converting moorland into food-bearing soil by means of the application of bacterised peat was brought forward by Prof. Bottomley, who quoted successful laboratory and field experiments in support. He stated that at Entwistle, in Lancashire, the yield of oats and mangolds had been doubled by its application.

The discussion on the collection and cultivation of medicinal plants was opened by Prof. H. E. Greenish, of the Pharmaceutical Society of Great Britain, who outlined the steps that had been taken during the last two years to make good the shortage of drugs consequent upon the war, and to establish a permanent